A CAHNERS PUBLICATION
SIX DOLLARS

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER, AND SYSTEMS COMPANIES — WORLDWIDE
MAY 20, 1991

CAN AN OLD BULL LEARN NEW TRICKS?

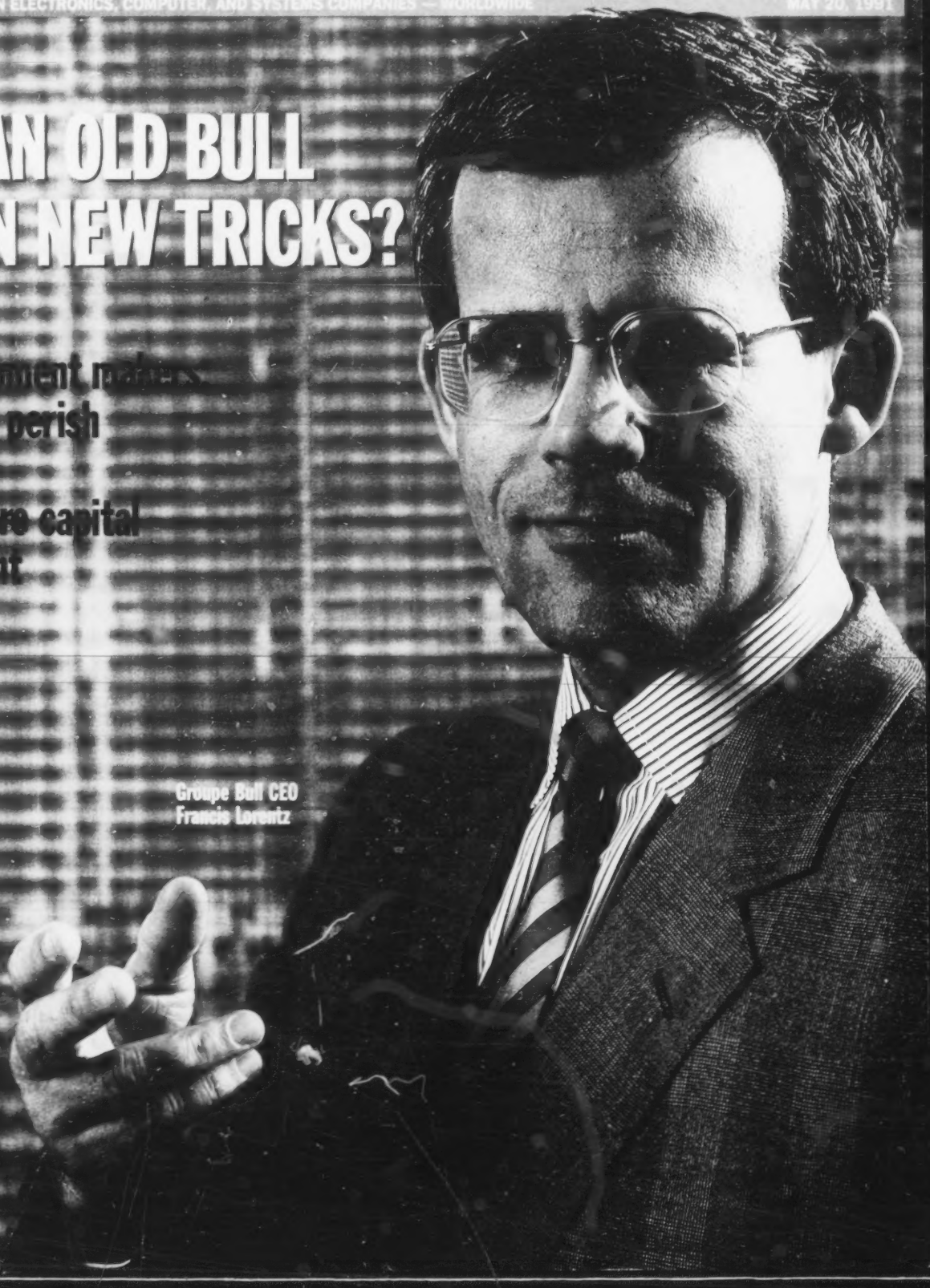
PAGE 26

Semi equipment makers: partner or perish

PAGE 34

Why venture capital is confident

PAGE 52



Groupe Bull CEO Francis Lorentz

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER, AND SYSTEMS COMPANIES – WORLDWIDE

VOL. 17, NO. 10 MAY 20, 1991

PAGE 26 Bull's Francis Lorentz: "We have no choice but to break even by 1992"

Cover: Steve Murez

COVER STORY/GROUPE BULL

26 Can you teach an old Bull to do new tricks?

France's Groupe Bull is struggling to change its culture. Burdened by years of financial instability and losses totaling $1.48 billion since 1989, CEO Francis Lorentz must now transform the bleeding company into a profitable one—or at least break even by 1992. Can Bull survive on its own, or will the French government finally abandon its political offspring?

UPDATE

9 Business Trends
Compaq and its allies play their ACE; Unix moves away from AT&T; U.S. trade gap narrows; Convex invades Cray's home turf; Sunjinks team pulls off another one; navigating made easy by Etak; rough times ahead for U.K. cellular phone market; charging chips to your VISA card

19 Companies to watch
Citrix Systems turns PCs into mini-mainframes; Concurrent Logic gratifies chip designers; Videomail creates full-motion videos

23 Commentary
Senior editor Elizabeth B. Baatz maintains that statistics are not all they are cracked up to be

COVER STORY/GROUPE BULL

26 Can you teach an old Bull to do new tricks?
Despite Groupe Bull's checkered history, the French government insists on portraying the company as a survivor in the European computer industry. But without leading-edge technology or a dominant European position outside of France, Bull's future is at least as shaky as its past

30 ZDS won't make money in the U.S. until next year
With Bull's backing, Zenith Data Systems is trying to carve out a better position in the U.S. marketplace. But some observers claim that Bull must first decide how ZDS fits into the company's overall strategy

STRATEGIES

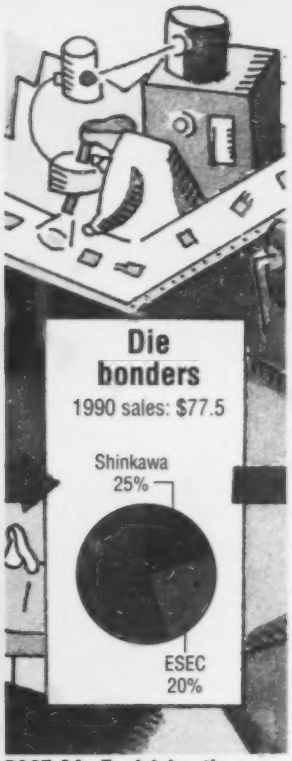
34 Semi equipment makers: partner or perish
As competition from well-heeled Japanese companies heats up, the equipment industry is compelled to create a strategy that will at least allow them to remain on the playing field

MANAGING RESOURCES

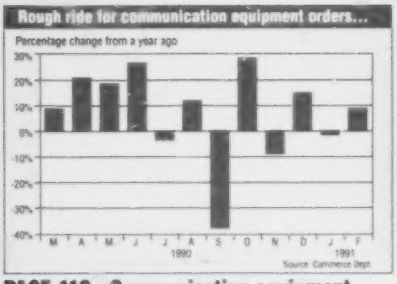
52 Why venture capitalists are quietly bullish
Despite fewer capital sources these days, venture capitalists are a happy lot. The reason: The venture business is shrinking, which should result in larger profits. More money in fewer hands, meanwhile, has turned the business into a matter of "survival of the fittest"

PAGE 9 Sunjinks strike again with this year's SHARKstation

PAGE 52 Mayfield Fund's F. Gibson Myers: By investing funds conventionally, IPOs are making everyone feel a lot better



PAGE 34 Explaining the semiconductor production process



PAGE 110 Communication equipment orders in for a rough ride

PAGE 68 S. G. Warburg's Chuck Goto: Canon has become very aggressive recently

MANAGING RESOURCES

61 **Venture capital directory**
The annual ELECTRONIC BUSINESS venture capital directory for the electronics industry

ASIA/PACIFIC BUSINESS

68 **Canon challenges Nikon's lead in Korea**
Although Nikon has a strong place in the Korean stepper market, it may soon run up against some stiffer competition. Semiconductor manufacturers are keeping a close watch on the race between Nikon and Canon. In the search for the best equipment, vendor loyalty may no longer be a top priority

MARKET PERSPECTIVES

99 **Prices plummet in low-end laser printers**
Vendors are trying to cut into Hewlett-Packard's lead in the low-end laser printer market. In the midst of a bloody price war, many are targeting market niches by offering enhanced features. Whether HP can retain its position remains to be seen

BUSINESS BAROMETER

110 **Communications**
Communication equipment sees some rekindling

111 **Consumer**
Consumer electronics defies recession concerns

DEPARTMENTS

5 **Inside Business**
106 **Advertiser Index**
107 **My View**
My barber looks at education
112 **Viewpoint**
Europe's computer dinosaurs will become extinct

COMPANIES IN THIS ISSUE

101 **An index of the companies covered in this issue**

EDITORIAL STAFF

Publisher: Frank J. Burge

Editor: Jeffrey Bairstow

Managing Editor: H. Garrett DeYoung

Senior Editors: Linda Stallmann (Financial), Rick Whiting, Barbara N. Berkman, Teri Sprackland, Elizabeth B. Baatz

Associate Editors: Peter L. Burrows, David Webb

Assistant Editors: Barbara Jorgensen, Xiong Xiaoge

Copy Editor: Elaine M. Cummings

Contributing Editors: Dwight B. Davis (Seattle), Madeline Franchi (Cahners Economics), Sarah Glazer (Boston), Julie Handelman (Cahners Economics), Nancy Rutter (San Francisco), Paula Doe (Seattle), John Farrell (Cahners Economics), Tom McHale, Joel McCormick, Russ Arensman (Hong Kong)

Correspondents: Charles Cohen (Tokyo), Geoff Crane (Seoul), Chris Brown (Taipei), Ken Stier (Bangkok), Craig Addison (Sydney)

Consulting Editors: Alberto Socolovsky, Allen Furst, Lewis H. Young

Senior Production Editor: Karen J. Covey

Assistant Production Editor: Maura A. Baker

Editorial Assistant: Jean O'Brien

ART STAFF

Art Director: Michael Roach

Associate Art Director: Carla Aguilar Leeder

Staff Artist: Michele G. Kane

EDITORIAL OFFICES

Boston: Cahners Building
275 Washington Street, Newton, MA 02158
(617) 964-3030 Telex: 94 0573 CPC BSN
Fax: (617) 558-4327 MCI: EBBOS

San Jose, Calif.: Teri Sprackland, David Webb
Sherman Building, 3031 Tisch Way, Suite 100,
San Jose, CA 95128 (408) 243-8838

Northwest: Dwight B. Davis
2924 Queen Anne Ave., N.
Seattle, WA 98109 (206) 284-5130

London: Barbara N. Berkman
27 Paul Street
London EC2A4JU England 011-44-71-628-7030
Fax: 011-44-71-628-5984

PRODUCTION

VP Production: Wayne Hulitzky

Director of Production/Manufacturing: John R. Sanders

Production Supervisor: Andrew A. Jantz

Production Assistant: Julie T. Kohn; (617) 964-3030

CIRCULATION

Circulation Manager: Ann Ward
44 Cook Street, Denver, CO 80206
(303) 388-4511

Total Circulation: 77,804

REPRINTS

ELECTRONIC BUSINESS articles are available on a custom printing basis at reasonable prices. Contact Andrea Marwitz, Cahners Reprint Service, Cahners Plaza, 1350 E. Touhy Ave., P.O. Box 5080, Des Plaines, IL 60018 (708) 635-8800
Electronic Business can be purchased on 35mm microfilm through University Microfilm Int. Periodical Entry Dept., 300 Zeeb Road, Ann Arbor, MI 48106

Electronics evolution at work

For a wounded corporation, there may be no upside to the principle of "survival of the fittest." In the marketplace, the process of natural selection can be brutal. The benefit falls to the industry that learns the lessons of survival.

This issue brings to light some of the evolutionary pressures that are putting the heat on electronics, computer, and systems companies. A case in point: Groupe Bull, the state-controlled dinosaur of France's computer industry, now a bleeding giant with losses totaling more than $1.2 billion.

Senior editor, Barbara Berkman

As London bureau chief Barbara Berkman reports, Bull and its chief executive, Francis Lorentz, have one do-or-die route up the evolutionary ladder: Migrate to open standards based on Unix, and market itself as a global provider of computer services and of systems and applications expertise, rather than just hardware. That means joining Unisys, Digital Equipment Corp., and other competitors in an alien low-margin environment. Along the way, Lorentz must find a way to integrate the personal-computer product line that came with the 1989 acquisition of Zenith Data Systems.

Can Groupe Bull make the open-systems transition, change its image, and stem its losses? Lorentz himself draws the bottom line when he says: "We have no choice."

Further casualties of marketplace evolution aren't hard to find, especially if you look at the venture capital market. But here, at least, the positive results are becoming apparent, reports associate editor Dave Webb from our San Jose bureau.

For one thing, say his venture sources, the feast-then-famine experience of the 1980s has left venture partners wiser and more cautious, more likely to study new companies with an eye to good management as well as bright technical ideas.

For another, the scarcity of venture funding means less technological duplication among U.S. start-ups, easing the competition among fledgling companies and reducing the risk of failure and subsequent bargain-basement takeovers by foreign companies.

One U.S. industry abandoned by venture capitalists is the manufacture of semiconductor production equipment, once the preserve of U.S. companies but now a stronghold of Japanese domination. This issue looks at how U.S. manufacturers are banding together to withstand the pressure from abroad. As contributing editor Valerie Rice reports, the effort seems to be paying off.

JOHN PARKER, contributing editor

ELECTRONIC BUSINESS® (ISSN 0163-6197, GST Reg. #123397457) is published twice a month, except monthly in December, by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington Street, Newton, MA 02158-1630. Terrence M. McDermott, President; Frank Sibley, Executive Vice President; Jerry D. Neth, Senior Vice President/Publishing Operations; J.J. Walsh, Senior Vice President/Finance; Thomas J. Dellamaria, Senior Vice President/Production and Manufacturing; Ralph Knupp, Vice President/Human Resources. ELECTRONIC BUSINESS® is a registered trademark of Reed Properties Inc., used under license. Circulation records are maintained at Cahners Publishing Company, 44 Cook Street, Denver, CO 80206-5800. Telephone: (303)388-4511. Second-class postage paid at Denver, CO 80206-5800 and additional mailing offices. **POSTMASTER:** Send address corrections to ELECTRONIC BUSINESS®, PO Box 173377, Denver, CO 80217-3377. ELECTRONIC BUSINESS® copyright 1991 by Reed Publishing USA; Ronald G. Segel, Chairman and Chief Executive Officer; Robert L. Krakoff, President and Chief Operating Officer; William M. Platt, Senior Vice President. Annual subscription rates for non-qualified people: USA, $84.95; Canada, $124.95; other countries, $149.95 per year; $140, air mail surcharge. Subscriptions include all issues. Except for special issues where price changes are indicated, single copies are available for $15.00 (USA, Canada/Mexico and foreign). Please address all subscription mail to Eric Schmierer, 44 Cook Street, Denver, CO 80206-5800. Cahners Publishing Company, A Division of Reed Publishing USA • Specialized Business Magazines for Building & Construction • Research • Technology • Electronics • Computing • Printing • Publishing • Health Care • Foodservice • Packaging • Environmental Engineering • Manufacturing • Entertainment • Home Furnishings • Interior Design. Specialized Consumer Magazines for Child Care • Boating • Wedding Planning.

BPA ABP

other companies, and signed up resellers who use its extensive, precise digital road maps of the U.S. and Europe in applications far more diversified than the company's original concept. It was acquired by Rupert Murdoch's News Corporation, which sees moneymaking potential in using digital road maps as an advertising medium. The Etak executives envision a world where a family driving along the road could punch in a request on the on-board navigation system, and the next five restaurants would be listed. At home, a database offering access to a digitized, mapped version of the Yellow Pages could provide a financial gusher. The U.S. Yellow Pages generates about $8 billion in revenue annually, notes Honey.

TERI SPRACKLAND

COMMUNICATIONS

Shaky times for U.K.'s cellular phone market

IN THE AFTERMATH of deregulation, the British telecom market is Europe's most liberalized. But that hasn't made it easy for vendors that sell into that market, and this year has been marked by consolidation in Britain's mobile industry.

Telepoint services—operated on one-way, CT-2 digital cordless technology based on the U.K.'s common air interface standard (CAI)—are in a tizzy. With no sight of profits in the near future, Philips and Shell Oil backed out of the BYPS Communications consortium, leaving Barclays Bank with a 5% stake after members sold BYPS to Hong Kong paging and cellular phone giant Hutchison Telecom last February. Now, Hutchison has amassed wide interests in the U.K. market, including cellular service provision, mobile data, paging, and telepoint operations.

Remaining telepoint operators, Mercury Callpoint and Phonepoint, are carrying on. Mercury is staying quiet on the investment front until the rest of Europe joins Britain in approving the CAI standard. Phonepoint, however, plans a major advertising campaign this summer, "almost relaunching the service," says Gail Kirby, mobile communications consultant with BIS Strategic Decisions in Luton, England.

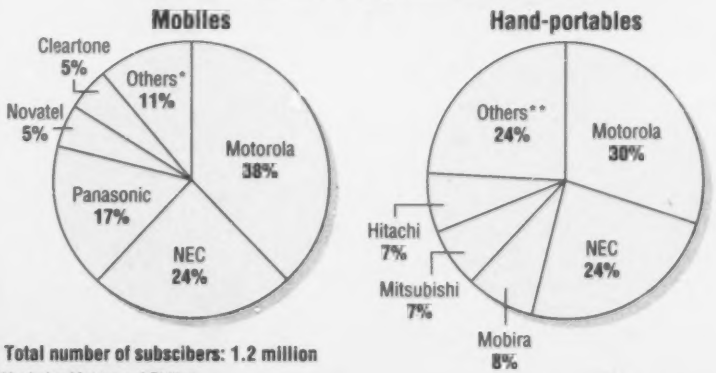
Meanwhile, mobile phone service providers fell from 50 to 35 after several acquisitions and bankruptcies. The problem: The rate of growth of cellular in the U.K. is falling fast because of the recession and the failure of many subscribers to pay their bills. What's more, Britain's chancellor, calling mobile phones a scourge of modern times that make motorways unsafe, slapped a £200 (about $360) income tax on each mobile phone used for business. The tax should affect telepoint and personal communication network phones, as well.

How will that tax affect equipment makers such as Motorola Inc. and Nokia? With business booming, not much. Nokia bought U.K. handset maker Technophone in February, boosting Nokia's share of the European hand-portable market to 14%. Sales of hand-portables in Europe grew 40% so far in 1990, compared with 30% a year earlier, says BIS.

BARBARA N. BERKMAN

Mobile and hand-portable equipment market

1990 U.K. market share by number of subscribers



Total number of subscribers: 1.2 million

*Includes Mobira and Philips

**Includes Panasonic, Technophone, and Kokusai

Source: BIS Strategic Decisions

FINANCING

Charge a new chip to your Visa card

GARY KENNEDY doesn't take American Express, but he will take Visa or MasterCard from people who just have to get prototype chips in a hurry. Twelve prototype chips will set you back a mere $1,500 and can be delivered to your door in about four weeks, claims Kennedy, the president of Orbit Semiconductor Inc., based in Sunnyvale, Calif.

That compares with typical prototyping costs of more than $65,000 and turnaround times of three months or longer, says Kennedy. What's the catch? Well, you will need a Sun workstation that will cost you around $13,000, plus a set of design tools either from the University of California at Berkeley (for full custom designs) or from the Microelectronics Center of North Carolina in Research Triangle Park, N.C. (for standard cell designs). The Berkeley tools are almost free, while the MCNC tools go for a paltry $5,000.

What does Orbit do in all this? Harried IC designers send Orbit a tape of a chip design and give a charge card number, and Orbit takes care of the rest. Orbit is a semiconductor company that has no products. The company provides only the service of making chips for other people, either in prototype form or in relatively low volumes. Last year Orbit did $25.5 million in making other people's chips.

The new prototyping service, called Foresight, is an attempt to bring cost-effective design tools and services to "the guy who's designing ICs in his basement," says Kennedy.

So far, some 45 customers have taken advantage of Orbit's Foresight service and a couple of them have actually charged the fee to plastic. Call (800) 331-4617 or, in California, (800) 647-0222.

JEFFREY BAIRSTOW

Semi equipment makers: partner or perish

U.S. semiconductor production equipment makers are being forced into partnering and other creative alternatives to financial failure

BY VALERIE RICE

"You need to be a masochist to stay in this industry."

Those chilling words from William Elder, CEO of Genus Inc. in Mountain View, Calif., could have been uttered by almost any executive in the embattled U.S. semiconductor equipment industry. As Elder points out, things are tough right now.

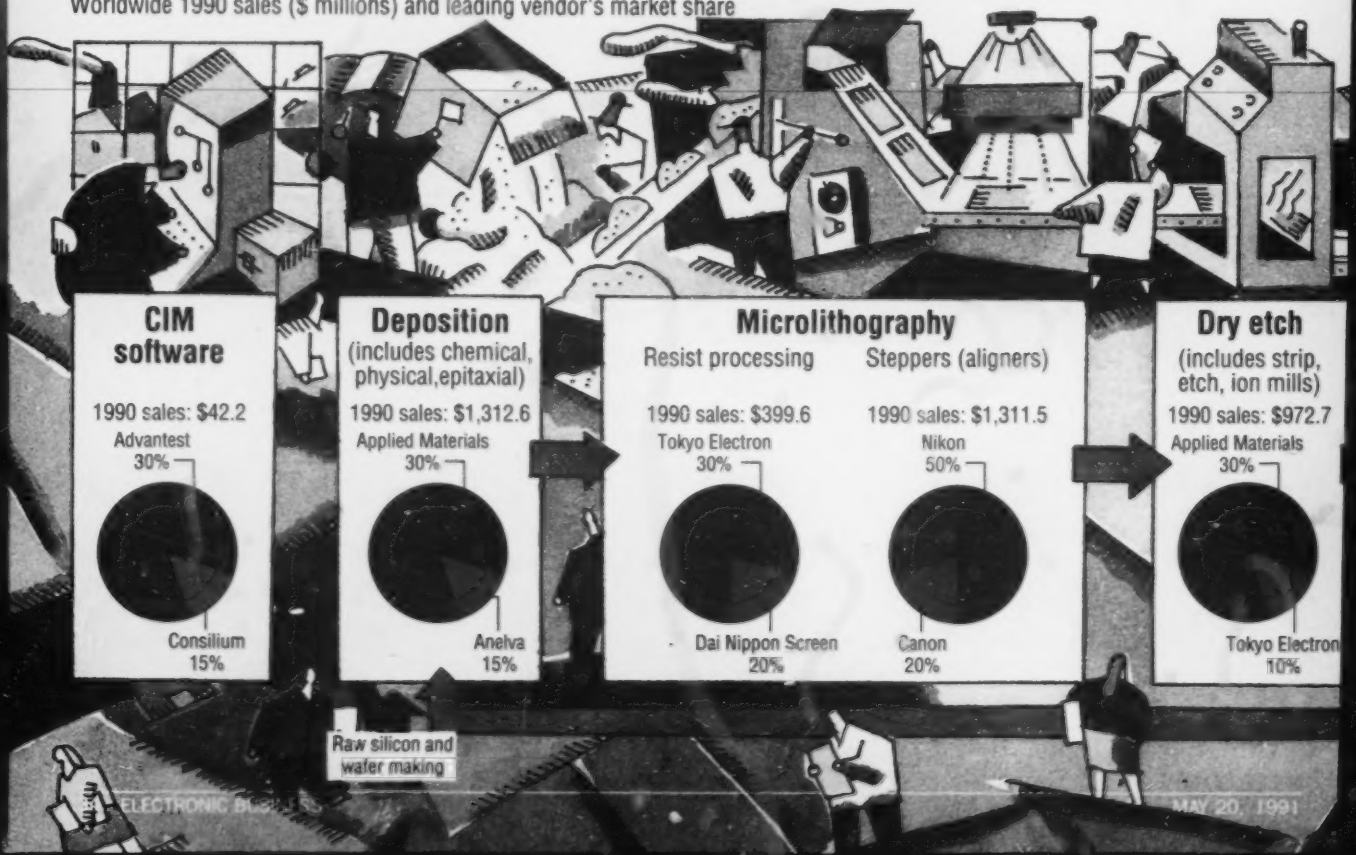
Plagued by insufficient capital, poor return on investment, and rapidly declining market share, the equipment industry in the United States has been overwhelmed by competition from better-funded Japanese companies. In less than 10 years, the U.S. industry has gone from owning the world market to lagging seriously behind Japan, which now is home to six of the ten largest equipment companies in the world. The equipment business has such a poor reputation for financial performance that venture capitalists have virtually abandoned it. Even the industry's bellwether, the mighty Santa Clara, Calif.-based Applied Materials Inc., was forced into layoffs earlier this year.

Unless changes are made, the outlook is not pleasant. Two recent studies on competitiveness singled out the U.S. equipment business as one of the weakest segments of the electronics food chain. One study, the second annual report from the National Advisory Committee on Semiconductors, said the U.S. industry will fall irretrievably behind Japan unless another $1.2 billion in capital is poured into it in the next 24 months.

The industry cannot afford to sit back and wait for government to

Semiconductor manufacturing and inspection equipment process

Worldwide 1990 sales ($ millions) and leading vendor's market share

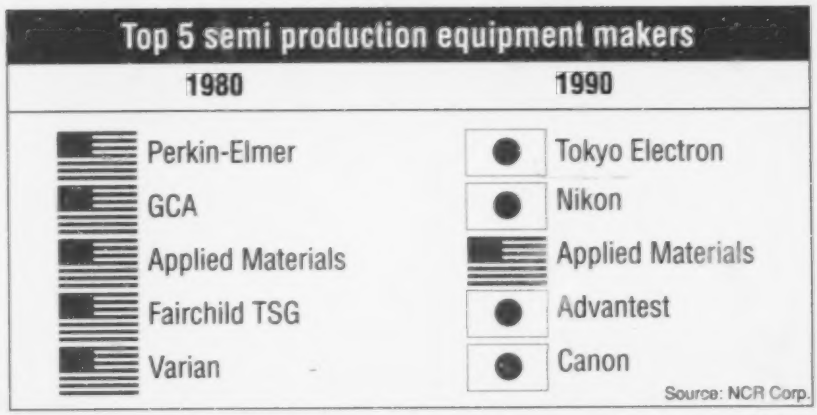


help—counting on a remedy that is likely never to materialize, executives say. So instead, it has come up with some prescriptions for its own cure, a cure that companies can implement at little or no cost. And many believe that these home-grown solutions are beginning to work.

"Over the last 20 years we have let our industry as a whole slip away," states Papken Der Torossian, chairman of Silicon Valley Group Inc. in San Jose. "But now we are doing something. I feel very optimistic." From informal partnerships between competitors and closer ties with customers to equipment standards and mini-consortia, the industry hopes to regain lost ground. None of these are quick fixes, however, and many continue to believe only government-sponsored changes in areas like tax and depreciation laws will put them back on the road to competitiveness.

Strange bedfellows

Ask Roger Emerick, chairman of Fremont, Calif.-based Lam Research Corp., what brought the U.S. equipment industry to its knees and he'll answer, "The lack of partnerships."

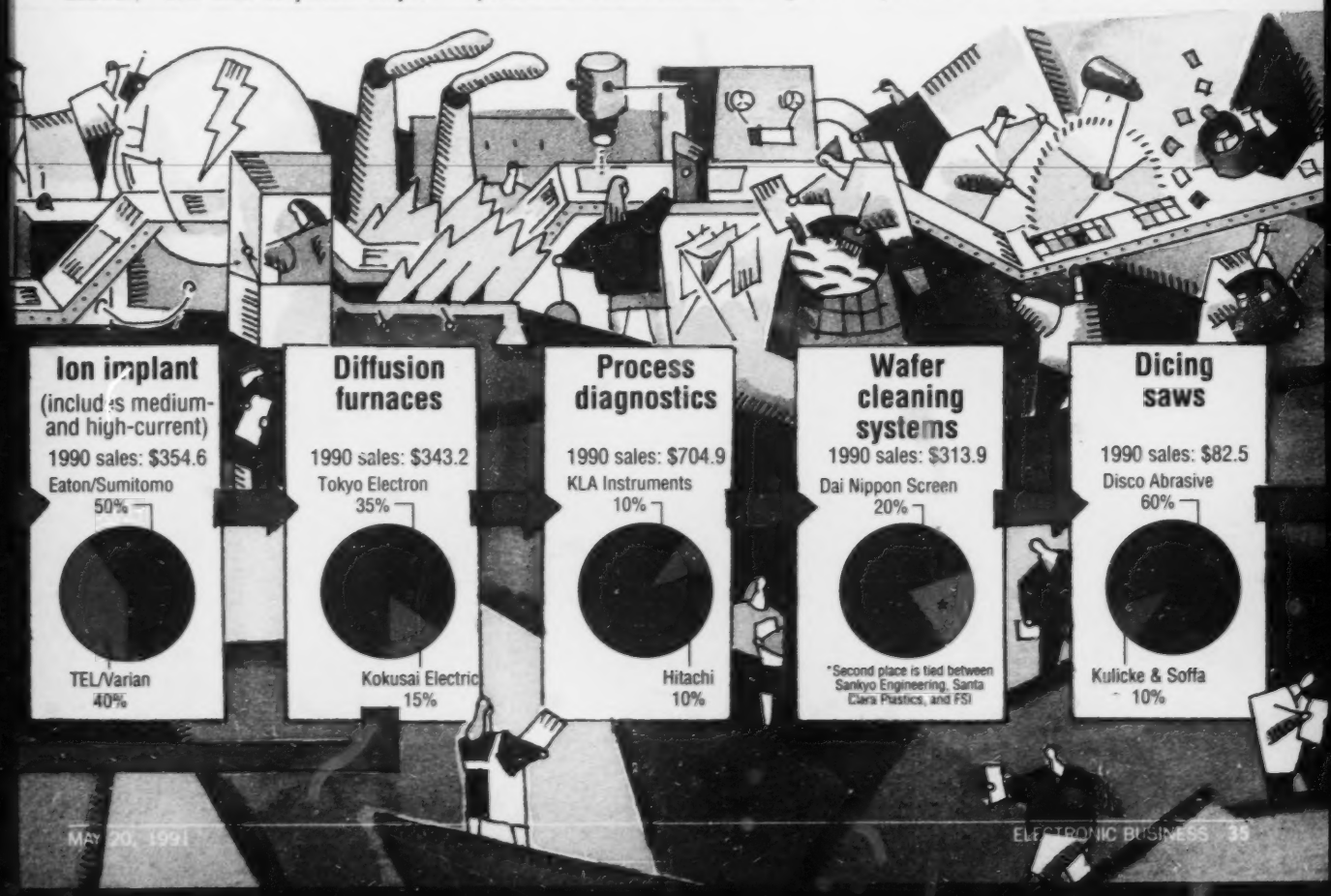


The Japanese, he says, are very good at working together; U.S. companies shy away from any kind of close cooperation.

But no more, Emerick says. Lam, Varian Associates Inc., Novellus Systems Inc., Genus, Silicon Valley Group, and others are slowly finding creative and mutually beneficial ways to team up with their competitors.

In Lam's case, Emerick was approached by Novellus chief executive Robert Graham, who needed an etch system to sell with his tungsten chemical vapor deposition machine. After making sure the machines worked well together, the two companies made a joint sales call to San Jose-based Cypress Semiconductor Corp. and got the sale.

And the partnering isn't stopping there. Novellus is also talking to Varian and Genus about similar deals, Graham says. "There's a lot of synergy here. And it absolutely does work. We showed [by teaming with Lam] that you can have a good system that works without being



Where are the customers?

As if the U.S. semiconductor equipment industry doesn't have enough problems, now its customers are disappearing.

According to data from San Jose market research firm VLSI Research Inc., U.S. semiconductor companies just aren't buying that much equipment anymore. In fact, they don't manufacture that much anymore and most U.S. start-ups depend on offshore foundries to make their chips. Thus, the onetime primary market for U.S.-made equipment is dwindling.

The market is, however, growing quickly in the Asia/Pacific region. But while Japan's semiconductor market is the world's largest, it is also one of the hardest to penetrate. For the nearly 800 equipment and materials companies that make up the U.S. industry—the vast majority of which are under $20 million a year in sales—that is bad news.

Large companies like Applied Materials Inc. in Santa Clara, Calif., sell about 60% of their equipment in Japan. But small companies lacking resources will have a difficult time following suit.

"The more sophisticated the technology gets, the more a big company is unwilling to take a risk on a company it doesn't know. A lot of small companies are going to be squeezed out of here," says William Elder, CEO of Mountain View, Calif.-based Genus Inc.

What this will mean is more consolidation in the industry, experts believe. "The guys operating out of their garages aren't going to be in business anymore," warns Silicon Valley Group's Papken Der Torossian.

On a positive note, the Semiconductor Equipment and Materials International trade association is trying to make it easier for small U.S. equipment companies to sell in Japan by setting up group trade tours designed just for them. □

hooked together. It cost the customer more money by selling the systems separately, but he got a better wafer out of it. This way the market size is going to expand."

Emerick believes these deals will form a template for how the industry should do business. "This industry has changed a lot over the last few years," he says. "This is the right solution."

VLSI Research Inc.'s president, G. Dan Hutcheson, agrees, calling the deal between Novellus and Lam "astounding. That's something that, for years, people said would never happen. We didn't think it was possible for Bob and Roger to sit in the same room, let alone do a cooperative agreement."

But Graham says these loose relationships are a must if the industry is ever to address its single largest problem: trying to do too much. "We are all bent on saying we should be the best, but we should not try to do everything," he insists. "You have to leverage with other vendors."

Teaming up with competitors is not the only answer. Sematech, the semiconductor manufacturing con-

Source: VLSI Technology

sortium in Austin, has tried for four years to get its member chip companies to talk to their equipment suppliers—a novel idea in the United States, and something many believe the Japanese do very well.

"One initial goal of Sematech was to learn how to work together, and that's the most important trend right now in the semiconductor equipment industry," Hutcheson says. "It's difficult to change attitudes. It's been an adversarial business between chip and equipment companies for 20 to 30 years."

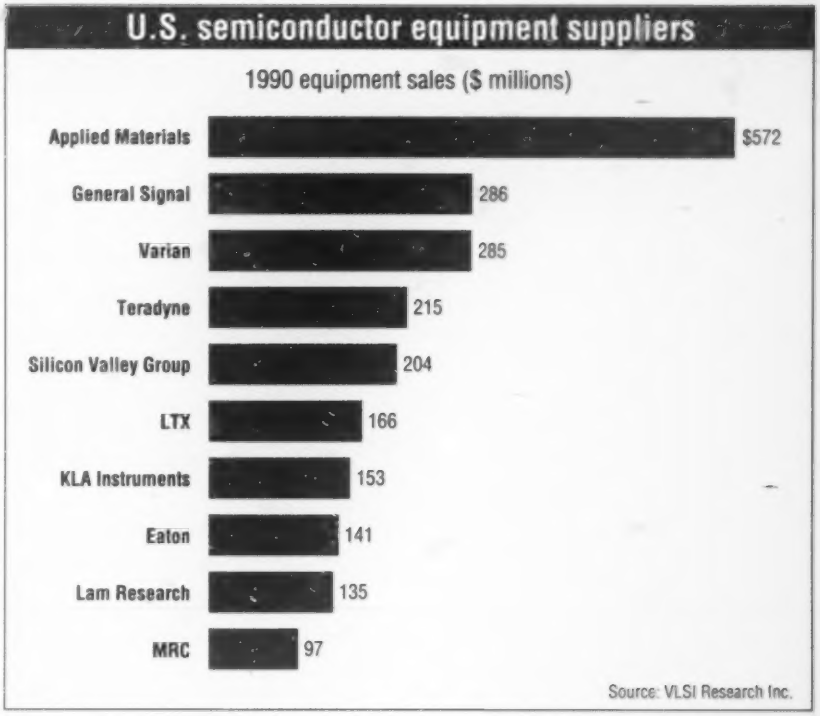
There are signs it is slowly changing, however. At Silicon Valley Group, a team of engineers from Motorola Inc. are working closely with one of the company's engineering teams to develop a new product, says Der Torossian. "Ultimately, everyone is going to benefit from that partnership," Der Torossian says, and he credits Sematech and its equipment arm, Semi-Sematech, with bringing the two sides together.

Genus's Elder agrees. "For the first time semiconductor companies are opening up and saying, 'Here are the specifications we want.' If you meet the specifications, you get the contract. There's none of this 'I'm not going to buy this unless you knock off 5%,' or anything like that."

The Sematech connection allows even small companies to get a foot in the door at large U.S. operations, Elder says. That's important at a time when fewer and fewer U.S. companies are buying equipment (see "Where are the customers?"). Along with its role as a communications facilitator, Sematech gives out awards to equipment companies that bid on research projects based on specifications supplied by Sematech member companies.

To date, Sematech has given out 59 grants for either equipment-improvement programs or joint-development programs, says Peggy Haggerty, Semi-Sematech vice president for public policy. A little over 40% of those awards have gone to companies with sales of under $10 million per year.

Some executives believe that this money, combined with R&D dollars from private companies, can help pull the industry out of its slump by boosting investment. Over the last 10 years, notes Der Torossian, the industry has spent an average of $200 million per year on R&D, or about 10% of sales. He adds that by the end of the decade, "we'll be spending $1.5 billion on R&D, or close to 16% of sales."



Setting higher standards

An international standards body doesn't seem an obvious place to look for help for the U.S. equipment industry, but the Modular Equipment Standards Architecture (MESA) movement may turn out to help the U.S. more than other countries, experts believe.

MESA, which recently became part of the Semiconductor Equipment and Materials International trade association, was started by industry leaders several years ago to find a way to take advantage of growing interest in modular equipment. For such equipment to function effectively, all pieces of the system must be standardized, analysts say. "MESA leverages the entire industry's efforts," says Hutcheson. "There is a significant value added for American companies."

U.S. equipment companies do a good job with process development, Hutcheson thinks, but they lack the economies of scale to fully de-bug them—U.S. equipment simply breaks down more often than Japanese equipment. With the MESA standards, U.S. companies will be able to focus on one part of the equation and build enough machines to ensure their reliability, he says. Hutcheson points to companies like Rapro Technology Inc. in Fremont, which is working on a MESA-standard wafer handler, as an example of a small company that is benefitting from working with the standards group.

In fact, MESA may be a boon to the hundreds of very small equipment companies in the United States, Lam's Emerick believes. "There is going to be much more investment in wafer handling and software, and a lot of little companies are going to be able to stay alive by teaming up to work in these areas," Emerick says.

The consortium cure

The most novel and, in many ways, the most promising solution to the industry's woes is a partnership between companies and their semiconductor customers—what some call a mini-consortium. But examples of this are tough to come by. One-year-old Etec Systems Inc., a Hayward, Calif.-based supplier of electron beam lithography equipment, is the

Why money won't help

Can money alone solve the U.S. semiconductor equipment industry's woes?

Maybe not. Many industry executives argue that money will neither get rid of the industry's structural problems nor force companies to change the behavior that got them into trouble.

There is no more eloquent advocate of this position than Robert Graham, CEO of Novellus Systems Inc. in San Jose. The well-known maverick firmly believes there is enough money in the industry. What it lacks, he thinks, is good management.

When capital is scarce, most equipment companies spend too much money on R&D, Graham says, partly because they have huge engineering staffs to keep busy. Novellus has a very small staff, which he augments occasionally with contract employees, keeping spending down to modest levels.

Novellus recently introduced a new machine that cost only $1.5 million to develop, a far cry from the $30 million or more some of his competitors spend to bring out new equipment. "We are doing R&D within our means," he says proudly. The company can accomplish this by following a business principle Graham calls "Little r, Big D." In the equipment business, one company usually controls basic research; Graham thinks companies should team up with the so-called research leader, use what's already been done, then focus their efforts on developing an improved system rather than starting from scratch. Strategic partnering allows a company to do that, Graham says, while saving huge amounts of time and money.

Novellus uses this strategy with its suppliers, customers, and competitors, giving the company the highest profit margins—60%—in the equipment industry.

It has also given Graham the flexibility to say no to a sale where he won't make his margins. But Mountain View, Calif.-based Genus Inc., which has struggled to stay in the black recently, can't afford *not* to discount sales, and company president William Elder disagrees with Graham's view of the world. "Pouring money in isn't the only solution, but it helps," he says. "In this business, where you have $1 million and $2 million pieces of equipment, one system is going to be the difference between being a hero or a bum [to stockholders]. If you have to cut $100,000 off the price to be a hero, you do it." □

only U.S. source for this type of machine. It may also be the first true consortium in the equipment industry. Etec was formed by IBM, DuPont, Micron Technology, Grumman, and Zitel, along with the management of Perkin-Elmer's former Electron Beam Technology Division.

Although company president Tom Halloran says it's a little early to predict whether Etec can serve as a model for the industry, things are "so far so good. We turned the company profitable, and in the first half of the year we are meeting or exceeding our plan."

Etec is private and Halloran declines to disclose its earnings, but he claims that this year it is up 50% over last year and the backlog is more than double. In other words, "We're launched. Customers like us, and they're comfortable with the players."

But the trick to Etec's long-term success is its investors, he believes. "Our time horizons are not necessarily next month. Because of the nature of our investors, we are in it for the long term."

Halloran warns, however, that consortia are not easy to set up. In Etec's case, it was "all in what we were asking people to do. There were enough players investing small amounts of money so that the deal was structured as a win-win. Being able to identify a strategic advantage to an alliance partner is a critical factor. Without it you don't have a consortium."

Silicon Valley Group's Lithography systems operation is also a version of a mini-consortium. The company acquired the troubled operation from Perkin-Elmer with financial assistance from both IBM and Sematech. The arrangement allowed SVG to purchase the division, and kept the technology in U.S. hands.

Despite all the effort going into industry-driven solutions, executives still hope government will step in and help out. "We aren't looking for a handout," Der Torossian stresses, "but the government has a responsibility to help itself. The government is *us* too."

In particular, the industry hopes to see changes in equipment depreciation schedules, the capital gains tax, and R&D incentives that would make the business climate in the United States more hospitable. "There is a lot we can do ourselves," according to Semi-Sematech's Haggerty. "But there's a lot only the government can do." □

Why venture capitalists are quietly bullish

Despite less cash in the coffers, the venture capital community is optimistic about its future

BY DAVE WEBB

Donald Valentine ought to have been upset. At a recent electronics industry financial conference, not only were there fewer companies vying for venture capital than in the past, but there were also fewer venture capitalists with money to invest. Instead Valentine, a partner at Sequoia Capital in Menlo Park, Calif., was practically euphoric. "It was a field day," he recalls. "In the past that meeting has been attended by hundreds of companies [seeking financing]. This year there were just three dozen."

In a time when venture funds continue to be neglected by capital sources and returns on long-term investments are depressingly meager, Valentine and his peers might well view the implications of that meeting with grave alarm. But the venture capital field is changing, and it is doing so in ways that venture capitalists such as Valentine view as positive for the industry. This year and next should be profitable for venture capitalists, largely because the venture business—which needed to become smaller—has, in fact, done so.

Venture fund investors have been diverting the little money they made from short-term funds into other types of investments. Because less money is available, the number of funds being reinvested has decreased dramatically.

According to Venture Economics Publishing Co. in Needham, Mass., 57 funds worth $1.8 billion were either closed or partially closed (ready to be invested) in 1990. Of those funds, 41 were actually follow-on funds—in other words, "new" funds raised by previously established management teams. In total, $1.85 billion was available for investment at the end of 1990 compared with the $2.4 billion that was available in 1989.

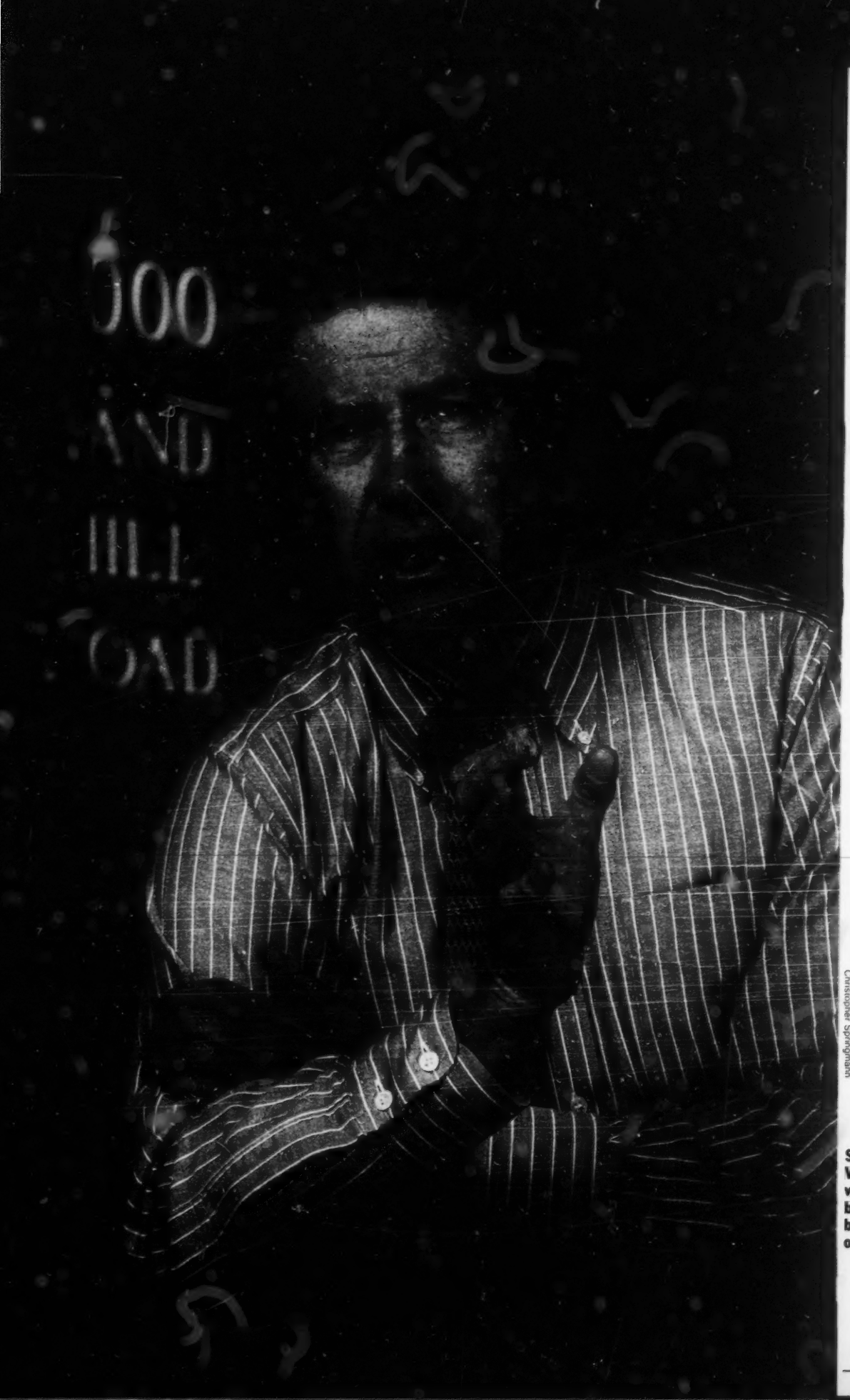
"Basically what's happening is that the funds aren't being re-funded," says Stephen Piper, a Venture Economics spokesperson. Out of the six major groups of fund contributors defined by Venture Economics, only two—pension funds and individual investments or trusts—increased their contributions to capital funds. The rest (see chart) sought greener pastures for higher returns. Real estate, stocks, and junk bonds were among those investments receiving contributions that might have otherwise gone into venture capital funds.

"Corporations, especially, are pulling out of venture capital," says Piper. "There's not only an uneasiness about venture capital in general, but corporations have gone through a learning curve. They got into the market in the early 1980s to see what it was like but have since pulled back to make later-stage funding rather than initial seed investments. They'd rather pay a premium now and know what they're getting."

More money is now in the hands of fewer venture partnerships. "It's survival of the fittest," says Sequoia's Valentine. "The strong will survive, and the weak will fall by the wayside. The number of venture firms that won't survive will far outnumber those that will start up."

This retrenchment is one of the consequences of a hell-for-leather investment orgy of the 1980s. That's as much the fault of the investors as of the partnerships that gathered the funds. "What investors did was put too much money into the hands of venture capitalists," says William Davidow, a partner of Mohr, Davidow Ventures in Menlo Park, Calif. "Less of that money should have gone into venture capital, and more should have gone into conventional investments."

In the 1980s the glut of venture capital financed start-ups across a broad swath of high technology industries. Often this resulted in the formation of look-alike companies with similar products or market focuses, which created competition that was too intense for such young, immature rivals. The companies frequently failed or were acquired at fire-sale prices that left investors empty-handed. Worse, in Valentine's view, the same struggling companies were picked up by foreign companies, often Japanese, which had the resources to



Christopher Springmann

Sequoia's Donald Valentine: The venture capital business is becoming "survival of the fittest"

capitalize on American innovation.

"The 1985 to 1990 timeframe was a period of enormous excess. The venture partnership community had 10 times too much money. We tended to overfinance technology only to let international interests pick it up for a song. That's the insidious part," says Valentine. "The number of computer-related companies being financed has dropped dramatically. I think that's great."

William Davidow: Investors should have put more money into conventional investments and less into venture capital

Valentine believes there aren't as many bright stars in management as one would think by the number of companies started a few years ago, and he adds that the venture community doesn't have the capability to manage that many companies.

Fewer companies with venture capital funding means venture fund partners will be selecting start-ups more carefully for investments. One of the lessons learned from the past is the need to scrutinize the management of new companies. If a company has great technology but doesn't have a solid kernel of management expertise with a tight business plan, it won't get funded.

"The biggest single change in the industry is that a clever group of people are more likely to get funded than a clever technology," says 3i Corp.'s Jim Bass. "They are looking for management that understands a market and, most important of all, how to reach it."

A good time to start a company?

Despite a lingering recession with less venture money and fewer start-ups being funded, venture capitalists are encouraging entrepreneurs to take steps to get started now. "The timing is good because everything is slowed down. You catch the wave. When the economy turns around, you're ready. It's an ideal time to start a company," says Paul Wythes, a partner at Sutter Hill Ventures in Palo Alto. The recession may discourage potential entrepreneurs from leaving a current employer to develop a new product. On the other hand, there may not be much competitive development, so an entrepreneur can be well ahead on the technology curve when the economy rebounds.

The end of the recession is expected to spark a significant round of public offerings, some of which have already taken place in the wake of a dry period in 1990. Registered IPOs, as of the first of March, included Zilog, Picturetel, Symix Systems, and Simtek. Others offering second rounds include Dell Computer and AST Research. Sybase, Wellfleet Communications, and Network Computing Devices are all candidates for IPOs this year.

Mayfield Fund's F. Gibson Myers: By investing funds conventionally, IPOs are making everyone feel a lot better

But while money is liquidated by the offerings, much of it will go into the hands of institutions that are likely to invest conventionally instead of in new venture funds. Nevertheless, "IPOs are making everyone feel a lot better," says Mayfield Fund partner F. Gibson Myers.

Likely investments in 1991

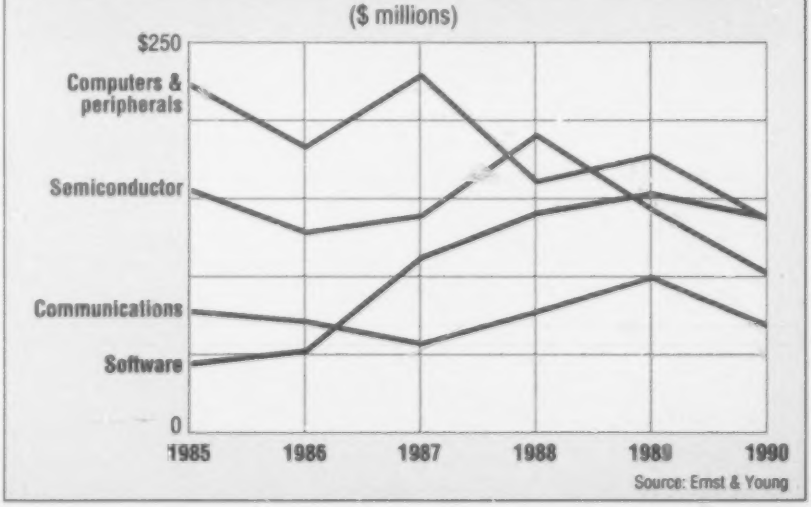
According to an Ernst & Young survey, $729.6 million was invested by venture firms in 1990. Out of the industries outlined in the survey, only the biotechnology/medical industry saw an increase in investment activity over the previous year. Communications, computers, semiconductors, computer peripherals, and software investments were down.

But the numbers can be misleading. Less venture money is available, but venture firms are eyeing software and communications (both computer network and telecommunications technologies) as two of the hot areas of investment opportunity. In software, pen-based computer and consumer game program innovators are attracting attention, as well as database and image system operating systems. Design automation is another fast-moving target of interest.

One of the few venture capital firm start-ups last year—Hummer, Winblad Venture Partners of Emeryville, Calif.—is "specializing" in software and received $35 million in institutional funding for start-up investments across the broad range of software market segments. "We still have to prove we can make money for investors," says partner John Hummer, "but we're bullish on innovation in software start-ups."

Telecommunications and computer network-related hardware and software are also promising areas of

Funds to computers fall while software rises



Source: Ernst & Young

Putting together the best package

Even during a recession, few venture capitalists will discourage a would-be entrepreneur from starting a company. But only about 1% of the proposals coming across most venture partners' desks get their serious attention. Fewer still get their money.

Given the current environment of tougher investment standards, how can you package your idea to maximize your chances of making the final cut?

First of all, be sure your CEO is experienced in the specific market in which you'll compete. "Build your company around the CEO," advises Stephen Coit, a general partner at Merrill, Pickard, Anderson & Eyre in Waltham, Mass. "Markets today are much more defined and complicated. It's critical that a CEO has a working knowledge of distribution in the start-up's market and of its targeted customers."

Second, determine if your marketing staff understands where and how your product will fit into the marketplace. Whiz-bang technology alone isn't enough. "A good [start-up] must be upfront with market research," Coit says. "Do your competitive assessment of the market before you write the first word of software code."

Third, you should consider how capital-intensive your technology or product is. Hardware is naturally capital-intensive, so new software products seem to have an immediate advantage. Still, says Coit, "there are terrific opportunities for superlative hardware designs." The trick is to develop a low-cost strategy and to forego the high margins typical of earlier successful start-ups such as Apple Computer Inc. and Compaq Computer Corp. "Start-ups that can demonstrate a practical low-cost approach," says Coit, "are more likely to catch our eye."

A fourth criterion your ability to leverage the entrenched distribution-channel infrastructure that will help you to reach your customers. The more a company grasps the differences between a "channel-driven" philosophy and a "market-driven" philosophy, the more attractive it becomes to the venture industry.

Fifth, you must prove you can get a product through development and into production without having to raise second-round financing. Tackling a project with insufficient capital will only leave you twisting in the wind.

Sixth, coolly assess the soundness of your technology. For the venture capitalist, says Coit, the technology or the product must be both "compellingly deep" and clearly better, in terms of both user benefits and cost efficiency, than existing products or services. "Good designs are efficient, and it's efficiency that keeps costs down and makes an attractive product," he advises.

Finally, venture partners are on the lookout for start-ups that have the financial confidence of other sources. Institutions, banks, and other corporations often provide investment or financing alongside venture funds. Joint development and marketing agreements with well-established companies also generate support. "You have to prove you are adept at using capital," warns Coit. "We shy away from those projects that appear as if the capital intensity will be too great." □

investment. Venture partnerships expect niche markets with such products as wireless telephones, wireless computer networks, and network management software to provide opportunities to grow several $50 million to $70 million companies.

Computer hardware gets mixed reviews. "The general feeling among venture partners is that it is getting hard to find something unique on the hardware side of the computer industry, while there is a lot of innovation taking place in software," says Sutter Hill's Wythes.

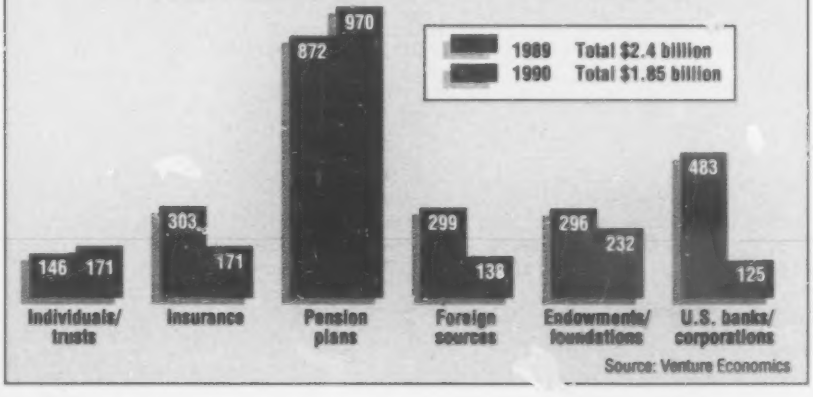
But partner Stephen Coit of Waltham, Mass.-based Merrill, Pickard, Anderson & Eyre says, "I think there are terrific opportunities for companies that can produce superlative hardware designs [because of enabling software innovation]." He is quick to warn, however: "The market is much less forgiving of 'me-too' products."

The right products with the right management can spark venture partners' interest. As New York-based Technologic Partners' Richard Shaffer says, "I don't know of any exciting companies that can't get all the money they want right now."

"But don't forget," adds Hummer, "there is a large amount of luck in our business. It's one thing to get elected, but it's another to know how to govern and do it successfully." □

Sources of venture capital

1989 numbers based on 80% of all new funds ($ millions)
1990 numbers based on 93% of all new funds ($ millions)



Source: Venture Economics

VENTURE CAPITAL DIRECTORY

Who's who in venture capital

A directory of venture capital contacts

Contact/Address								
3i Ventures 99 High St., #1530 Boston, MA 02116	Allan R. Ferguson 617-542-8560	=	169	19	125	16	NA	Transwitch, Unifi Communications, Simtelligence
Accel Partners One Palmer Square Princeton, NJ 08542	Don H. Gooding 609-683-4500	=	95	80	41	203	The Santa Cruz Operation, Actuate, Synopsys	
Advanced Technology 10 Post Office Square, #970 Boston, MA 02109	Albert E. Paladino 617-423-4050	◆	26	17	16	8	60	Actel, Microwave Networks, Performance Semiconductor
Alpha Partners 2200 Sand Hill Rd., #250 Menlo Park, CA 94025	Brian J. Grossi 415-854-7024	=	NA	NA	25	21	NA	Dell Microproducts, Pyramid Systems, Viewpoint Systems
AVI Management Partners 3000 Sand Hill Rd., Bldg. 3-280 Menlo Park, CA 94025	Peter L. Wolken 415-854-4470	◆	36	35	32	31	65	Power Up Software, Micronics Computers, Sierra
BancBoston Ventures 100 Federal St. Boston, MA 02110	Henry W. Newman 617-434-2442	=	30	9	40	17	NA	Infocus, Xyplex, Harmon
Battery Ventures 200 Portland St. Boston, MA 02114	Richard D. Frisbie 617-367-1011	◆	50	50	30	30	75	Marcam, In Focus Systems, Banyan
Bessemer Venture Partners 3000 Sand Hill Rd., Bldg. 3-225 Menlo Park, CA 94025	Neil Bowmaster 415-854-2200	◆	100	30	80	22	NA	Parametric Technology, Versant Object Technologies, Vitesse
Brantley Venture Partners 20600 Chagrin Blvd. Shaker Heights, OH 44122	Robert P. Pinkas 216-283-4800	◆	9	1.5	11	2	45	Implex, Ohmicron
Brentwood Associates 11150 Santa Monica Blvd., #1200 Los Angeles, CA 90025	G. Bradford Jones 213-477-6611	=	120	100	50	40	400	Vitesse, Communications, Cirrus Logic, SunOptics
Burr, Egan, Deleage & Co. One Post Office Square, #3800 Boston, MA 02109	Jonathan Flint 617-482-8020	◆	215	75	115	47	318	SyQuest Technology, Broderbund Software, Cadre Technologies
Charles River Ventures 67 Batterymarch St. Boston, MA 02110	Barbara A. Franks 617-439-0477	◆	192	101	40	NA	NA	Parametric Technology, Chipcom, Xyplex
Charter Venture Capital 525 University Ave., #1500 Palo Alto, CA 95301	A. Barr Dolan 415-325-6953	◆	NA	NA	30	15	NA	Metricom, InterFax, ELF Technologies
Chatham Ventures 120 Bedford St. Lexington, MA 02173	Brian Shortsleeve 617-863-0970	=	2	2	11	10	25	Barrier Systems, Voice Powered, Applix
Concord Partners 535 Madison Ave. New York, NY 10022	John Foster 212-906-7100	=	125	54	46	20	175	Sundisk, Cayman Systems, Metaphor Computer Systems
Custech Management 200 Franklin St., #530 Boston, MA 02110	Michael H. Gladstone 617-439-6190	=	30	25	NA	NA	34	Vitesse, Banyan Systems, Data Technology

VENTURE CAPITAL DIRECTORY

Company/Address	Contact							
El Dorado Ventures Two North Lake Ave., #480 Pasadena, CA 91101	Brent Rider 818-793-1936	◆	37	34	14	12	53	Novellus Systems, Cellular Data, Paradigm Technology
Euclid Partners 60 Rockefeller Plaza New York, NY 10020	Milton J. Pappas 212-489-1770	◆	13	8	12	7	50	Software Developers, Iron, Ascor
Fostin Capital P.O Box 67 Pittsburgh, PA 15230	William F. Woods 412-928-1400	=	36	16	44	20	75	Minc, Sherpa, Metallized Paper Corp. of America
Glenwood Management 3000 Sand Hill Rd., Bldg. 4-230 Menlo Park, CA 94025	Dag Tellersen 415-854-8070	◆	35	30	26	23	75	Opus Systems, Array Technology, Paradigm Technology
Glynn Capital Management 3000 Sand Hill Rd., Bldg. 4-235 Menlo Park, CA 94025	John W. Glynn 415-854-2215	◆	17	15	24	21	25	Celeritek, Banyan Systems, Ultra Network Systems
Grace Horn Ventures 20300 Stevens Creek Blvd., #330 Cupertino, CA 95014	Dr. Mark Dubovoy 408-725-0774	◆	41	26	49	21	92	Immunex Electronics, IXYS, Micro Linear
Greylock Management One Federal St. Boston, MA 02110	William H. Helman 617-423-5525	◆	131	68	70	37	275	Banyan Systems, Ascend Communications, CATS Software
Hambro International 650 Madison Ave. New York, NY 10022	Julie Lane 212-288-7778	=	121	51	53	24	150	Rasna, Solectron, Edsun
Hancock Venture Capital One Financial Center Boston, MA 02111	Robert Wadsworth 617-350-4002	=	550	180	100	30	800	None supplied
Highland Capital Partners One International Place Boston, MA 02110	Paul A. Maeder 617-330-8765	◆	30	15	14	10	75	Bypass, SCI Inc., Avid Technology
HMS Capital Partners 170 Middlefiled Rd., #150 Menlo Park, CA 94025	R. G. Grey 415-324-4672	◆	12	12	11	11	17	Meridian Data Systems, Multipoint Networks
Hook Partners 3102 Oak Lawn Ave., #545 Dallas, TX 75219	David J. Hook 214-528-5451	◆	20	19	22	19	25	Vitesse Semiconductor, Pads Logic, Insite Peripherals
Idanta Partners 10975 Torreyana Rd., #304 San Diego, CA 92122	Dev Purkayastha 619-452-9690	◆	88	72	13	9	100	Iomega, Elite Microelectronics, Pacific Communications, Sciences
Indosuez Ventures 3000 Sand Hill Rd. Bldg. 2-180 Menlo Park, CA 94025	David E. Gold 415-854-0587	=	25	20	25	20	34	Cisco Systems, Sierra, Vitesse
InterWest Partners 3000 Sand Hill Rd., Bldg. 3-255 Menlo Park, CA 94025	Therese J. Kollerer 415-854-8585	◆	NA	NA	NA	NA	250	Xilinx, Radius, Network Computing Devices
JAFCO America Ventures 180 Malden Lane, 21st floor New York, NY 10038	Shoichi Fujiwara 212-269-8900	=	15	12	22	12	300	Micronic, Epoch Systems, Aehr Test
Kleiner Perkins Caufield & Byers 2200 Geng Rd., #205 Palo Alto, CA 94303	Floyd Kvamme 415-424-1660	=	400	300	100	70	545	GO, Radius, Proteon, Gazelle Microcircuits
Lawrence, Tyrrell, Ortale & Smith 515 Madison Ave., 29th floor New York, NY 10022	Brian Horey 212-826-9080	◆	61	17	35	11	115	Sesar Software, Fabrem, Vision

VENTURE CAPITAL DIRECTORY

Company/Address	Contact							
Massachusetts Technology 131 State St., #215 Boston, MA 02109	John F. Hodgman 617-723-4920	=	17	11	31	22	12	None supplied
Mayfield Fund 2200 Sand Hill Rd. Menlo Park, CA 94025	Glenn M. Mueller 415-854-5560	=	370	NA	47	47	275	Silicon Graphics, Mips, Aspect Telecommunications
Menlo Ventures 3000 Sand Hill Rd., Bldg. 4-100 Menlo Park, CA 94025	DuBose Montgomery 415-854-8540	◆	150	125	60	50	285	SynOptics, Aspect Telecomm, Xyplex, Frame Technology
Merrill, Pickard, Anderson & Eyre 3000 Sand Hill Rd., Bldg. 1-240 Menlo Park, CA 94025	Michael C. Bruns 415-854-7236	=	NA	NA	NA	NA	NA	None supplied
Montgomery Bridge/Pathfinder 600 Montgomery St., #2100 San Francisco, CA 94111	John C. Siegler 415-627-2039	=	100	75	46	34	60	Proteon, Retix, MicroLinear
Morgan, Holland Ventures One Liberty Square Boston, MA 02109	Jay Delahanty 617-423-1765	◆	30	40	25	20	100	Star Semiconductor, Microwave Logic, Dataware Technologies
Morgenthaler Ventures 629 Euclid Ave. Cleveland, OH 44114	Theodore A. Laufik 216-621-3070	◆	72	33	44	17	160	Hypres, Intelledex, Censtor
New England Capital One Washington Mall Boston, MA 02108	Tom Tremblay 617-573-5400	=	16	3	50	25	20	Credence Systems, MRS Technology, Banyan Systems
Newtek Ventures 500 Washington St., #720 San Francisco, CA 94111	John E. Hall 415-986-5711	◆	20	15	23	16	50	Caere, Logic Modeling, Prometrix
Olympic Venture Partners 2420 Carillon Point Kirkland, WA 98033	George R. Cone 206-889-9192	◆	NA	NA	27	20	56	Xilinx, Symbiotic, Lucid Research
Paragon Venture Partners 3000 Sand Hill Rd., Bldg. 2-190 Menlo Park, CA 94025	Robert F. Kibble 415-854-8000	◆	33	24	23	17	70	SynOptics, Four Pi Systems, Credence Systems
Partech International 101 California St., #3150 San Francisco, CA 94111	Vincent Worms 415-788-2929	◆	100	50	20	8	220	Cadence, Verilone, Biosym
Pathfinder Venture Capital 7300 Metro Blvd., #585 Minneapolis, MN 55435	Brian P. Johnson 612-835-1121	◆	60	25	53	22	100	Digital Systems Intl., Confertech Intl., Aetrium
Pioneer Ventures 1299 Ocean Ave., #300 Santa Monica, CA 90401	Steve Hall 213-458-1441	◆	32	25	28	23	44	None supplied
Poly Ventures Polytechnic University, Rt. 110 Farmingdale, NY 11735	Shelley A. Harrison 516-249-4710	=	NA	NA	15	5	30	None supplied
Prudential Venture Mgmt. Co. 33 N. Michigan Ave., #1812 Chicago, IL 60601	David C. Swanson 312-853-1812	NA	NA	NA	NA	NA	NA	None supplied
Sequoia Capital 300 Sand Hill Rd., Bldg. 4-280 Menlo Park, CA 94025	Donald T. Valentine 415-854-3927	NA	NA	NA	NA	NA	NA	None supplied
Shaw Venture Partners 111 Southwest Fifth Ave., #2200 Portland, OR 97204	Allen J. Shaw 503-228-4884	◆	35	27	28	20	90	Actel, Protocol Systems, Nequent Computer Systems

VENTURE CAPITAL DIRECTORY

Company/Address	Contact/Phone	Investment plans over the next year*	Dollar investment ($ millions)	Total Electronics	Number of Companies invested in	Total Electronics	Total paid-in capital	Some companies currently funded
Sierra Ventures 3000 Sand Hill Rd., Bldg. 1-280 Menlo Park, CA 94025	Vincent H. Tobkin 415-854-1000	▲	82	71	28	21	100	Stratacom, Advantage Product Technology, Intuit
Sigma Partners 2884 Sand Hill Rd. Menlo Park, CA 94025	Lawrence G. Finch 415-854-1300	▲	50	45	40	37	120	None supplied
Spectra Enterprises 200 N. Westlake Blvd., #215 Westlake Village, CA 91362	James A. Cole 805-373-8537	=	13	12	18	16	23	Vitesse Semiconductor, Microwave Modules & Devices, EESOF
Sprout Group 140 Broadway New York, NY 10005	Richard E. Kroon 212-504-3600	▲	126	42	52	19	333	Ventana, Norand, Viewlogic Systems
SRB Management 13455 Noel Rd. Dallas, TX 75240	Sandy Fuehr 214-702-1100	▲	130	120	35	33	150	Proteon, Cyrix Semiconductor, Shared Resource Exchange
St. Paul Venture Capital 385 Washington St. St. Paul, MN 55102	Fredric R. Boswell 612-223-2135	▲	250	100	50	20	NA	Tricord Systems, BroadBand Technologies, Cayman Systems
TA Associates 45 Milk St. Boston, MA 02109	Stephen J. Gaal 617-574-6700	=	300	235	76	66	500	PrairieTek, Epoch Systems, BroadBand Technologies
Technology Venture Investors 3000 Sand Hill Rd., Bldg. 4-210 Menlo Park, CA 94025	Mark G. Wilson 415-854-7472	=	150	130	40	35	270	Farallon Computing, Intuit, Synopsis
Trinity Ventures 155 Bovet Rd., #700 San Mateo, CA 94402	Noel J. Fenton 415-358-9700	▲	37	21	26	15	53	Ikos, Alldata, Resonex
TVM Techno Venture 45 Milk St. Boston, MA 02109	Waldemar Jantz 617-457-5251	=	30	20	45	25	60	Inktext, Digital Radio Laboratories, Keyfile
Venrock Associates 30 Rockefeller Plaza #5508 New York, NY 10112	Peter O. Crisp 212-649-5657	▲	NA	NA	NA	NA	NA	None supplied
Venture Capital Fund of New England 160 Federal St., 23rd floor Boston, MA 02110	Kevin J. Dougherty 617-439-4646	=	30	25	40	30	50	Progress Software, New Media Graphics, Microwave Modules & Devices
Venture Funding Group Intl. 49 West 12th St. New York, NY 10011	Allan E. Skora 212-691-9895	▲	9	6	7	4	NA	None supplied
Weisz, Peck & Greer 555 California St., #4760 San Francisco, CA 94104	Philip Greer Robert J. Loarie 415-622-6864	▲	80	34	43	21	72	Adaptec, Network Computing Devices, Four-Pi Systems
Wind Point Partners 1525 Howe St. Racine, WI 53403	James Forrest 414-631-4553	▲	95	12	50	8	126	In-Store Advertising, Power Trends, Effective Management Systems
Zero Stage Capital Co. One Broadway, 10th floor Cambridge, MA 02142	Gordon B. Baty 617-876-5355	=	26	18	33	22	40	Octocom Systems, Swan Technologies, Mercury Computer Systems

*▲increase, ▼decrease, =stay the same

Please note that this is not a complete listing of venture capitalists that serve the electronics industry, but a directory of those companies that chose to participate in our survey.

Canon challenges Nikon's lead in Korea

Nikon dominates the Korean stepper market, where DRAMs are king—but Taiwan's ASIC business is still wide open

BY RUSS ARENSMAN

Korea's largest semiconductor maker, Samsung Electronics Co., is one of the largest and most loyal customers of Japan's Nikon Corp. To date, Samsung has purchased about 100 Nikon stepping projection aligners, or steppers, which cost more than $1 million each and are used to project microscopic circuit patterns onto the silicon wafers Samsung uses to build its most complex dynamic random-access-memory (DRAM) chips.

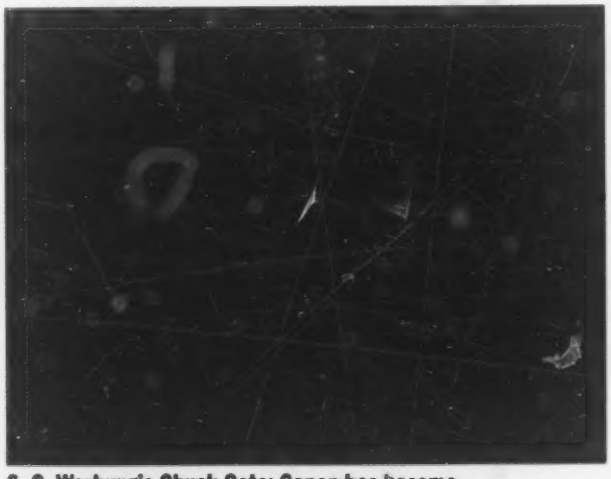
Although Samsung officials say they are quite satisfied with the Nikon steppers and have no plans to switch their DRAM production to another vendor's machines, several of the newest steppers in the company's DRAM factories near Seoul were purchased from Nikon's archrival, Canon Corp. Samsung's engineers will spend the next year or more evaluating the latest offerings from the two Japanese companies, and by 1993 the company expects to select one vendor to supply dozens of additional steppers for its next chip factory, which will produce 16-megabit DRAMs.

Steppers are too important a part of the chipmaking process to let loyalty to a single vendor stand in the way of using the best possible equipment. So Samsung, like many other semiconductor manufacturers, must constantly keep abreast of the new equipment that is developed by the other vendors.

Competition is particularly aggressive in the stepper business, because suppliers who fall behind in technology development—or any aspect of quality control, marketing, service, or customer support—risk losing tens of millions of dollars with just a single order.

Presently considered the world's largest stepper company, Nikon has a commanding lead in the Korean—as well as the worldwide—stepper market. Industry officials estimate Nikon's market share in Korea to be close to 50%, with Canon in second place, having sold perhaps 30% of Korea's 500-plus steppers now in use. GCA Corp. and Ultratech Stepper—both subsidiaries of Stamford, Conn.-based General Signal Corp.—and Japan's Hitachi Ltd. share the relatively small portion of the market that remains.

"Korea has grown up on Nikon—it's a Nikon country," according to Bill Delaney, managing director of Intraco Asia, which sells and supports steppers from Netherlands-based ASM Lithography Inc. in Korea and Taiwan. He concedes that ASM Lithography's steppers have attracted only a few customers in Korea so far.



S. G. Warburg's Chuck Goto: Canon has become very aggressive recently

Depending on DRAMs

The main reason Nikon does so well in Korea (and its home market of Japan) is that Nikon's stepper business depends heavily on the DRAM industry, which is concentrated in Japan and, to a lesser degree, Korea. While Nikon steppers can be used to make other kinds of semiconductors, they have been optimized for high-volume memory chip production.

As a result, about 80% of the company's business comes from DRAM makers. "Korea has a tendency to buy what's selling well in Japan because Korea's strategy—like Japan's—is in DRAMs," according to G. Dan Hutcheson, president of VLSI Research Inc., a San Jose technology research firm.

But the situation is much different a few hundred miles to the south. There, in Taiwan, the stepper market is more evenly distributed, with ASM Lithography, Nikon, and Canon each possessing roughly 30% of market share. Most of the country's chip companies have avoided the cutthroat DRAM market and concentrated instead on building application-specific integrated circuits (ASICs), primarily for personal computers and telecom.

Despite their differences, both countries' chip industries have been grow-

ing rapidly, and the dozens of new chip plants constructed in Korea and Taiwan in recent years have provided a significant new market for semiconductor equipment vendors. Hutcheson estimates the Asian semiconductor fabrication industry outside of Japan, most of which is concentrated in Korea and Taiwan, purchased about $160 million, or 13%, of the world's $1.2 billion in steppers sold during 1989.

Equipment sales have been growing faster in the two countries than in Japan, he says, although preliminary figures for 1990 indicate their market growth rates may have slowed substantially last year. "The Koreans are trying to digest what they already bought," he says, while most of Taiwan's chip makers have put further expansion on hold while they scramble to find enough business to fill all the new chip factories built there during the past two years.

Only two Taiwanese companies—ASIC-maker Macronix International Co. and a DRAM joint venture between Acer Inc. and Texas Instruments Inc.—are building new plants that will require a substantial number of new steppers this year.

U.S.-based Vitelic Inc., which ran out of money to complete its new $115 million Taiwanese plant early this year, may also be buying steppers soon, following its recent agreement to merge with Taiwan's cash-rich Hualon Microelectronics Co.

In Korea, Goldstar Electron Co. is expected to make the only major purchase this year when it begins to equip a new 4-Mb DRAM production line.

Nikon versus the world

So Nikon clearly remains the leading stepper vendor, both in the Asian region and the rest of the world. But it no longer dominates the industry to the degree it used to. The Tokyo-based company sold 530 steppers in 1988, 460 in 1989, and was expected to sell even fewer during fiscal year 1990, which ended in March. One reason for the downturn was the 20% sales decline last year in the world DRAM market, which hit Nikon harder than other vendors. Another reason, however, was the strong competition Nikon has been facing from Canon and others.

"Last year Canon made a very aggressive move and started undercutting prices and increasing services," says Chuck Goto, a senior technology analyst with S. G. Warburg Securities (Japan) Ltd. in Tokyo. Hitachi, which used to make steppers mainly for its own internal use but has now begun to pursue outside customers, has also been quite successful, Goto says—especially in Japan, where it sold more than 100 units last year.

Steppers are too important to let vendor loyalty stand in the way of using the best equipment

Although 1990 market statistics are still being compiled, they will undoubtedly show an increase in Canon's share of the stepper market. "Canon has started shipping a great deal to Korea," says Goto. At Samsung, for instance, company officials say that in addition to the 4 or 5 Canon steppers under evaluation for DRAM production, they have purchased about 15 Canon steppers for another operation that makes ASICs and linear chips for the company's electronics products.

S. E. Ju, director of Korea's Hyundai Electronics Industries Co.'s semiconductor division, says his company started out in the mid-1980s using U.S.-built steppers from Eaton Corp. and GCA. Since then, it has purchased most of its steppers from Nikon.

Most recently, Hyundai bought 20 Nikon steppers for its newest DRAM factory, which opened last spring and should reach its full production capacity of 20,000 6-inch DRAM wafers a month by midyear. But the company also bought and is evaluating a pair of Canon steppers, which could replace Nikon's in the company's next DRAM plant.

"There are three very strong vendors now, all of them in Japan," says Hee Gook Lee, executive director of Goldstar Electron. The company previously used a lot of U.S. steppers from GCA and Ultratech Stepper. But most of the 70 steppers the company has purchased in recent years have come from Canon and Hitachi, and a few from Nikon.

Performance and reliability

Goldstar Electron is Hitachi's only substantial customer in Korea so far, but Lee dismisses claims by rival stepper vendors that his company is being forced to use only Hitachi's steppers as part of its 1989 deal to acquire Hitachi's 1-Mb and 4-Mb DRAM production technology. "Hitachi, itself, uses a lot of Canon steppers," he says, adding that Goldstar Electron's criteria for selecting steppers is fairly simple: "We try to purchase the best performance machine."

Taiwan's largest chip company, United Microelectronics Corp., is using 10 steppers—4 from Ultratech and 6 from Canon—in its oldest manufacturing plant. In 1989 it purchased 17 Nikon steppers to equip its second plant. The company originally selected Canon to supply steppers for its second plant, but it switched to Nikon because of engi-

SEMI's director Chang-Ho Kim (left) and the organization's president, George Moore

neering problems with the Canon machines.

UMC executive vice president Ing-Dar Liu says the company is now evaluating steppers from Nikon, Canon, and ASM Lithography, although it isn't likely to make another large purchase until 1992. When it does, it will probably buy "i-line steppers," which produce circuit patterns with much thinner lines than mainstream "g-line" steppers. That would appear to give an advantage to ASM Lithography because their reputation in the industry has been in i-line technology.

But while ASM Lithography had an early lead in the technology, both Canon and Nikon are now offering i-line steppers of their own. Moreover, both Japanese companies' steppers have better reputations for reliability.

Taiwan Semiconductor Manufacturing Co., Taiwan's second-largest chip company, bought 10 Nikon steppers for its first manufacturing plant in 1987. But for the initial phase of its second plant, it bought 17 ASM Lithography steppers.

TSMC's vice president of operations F. C. Tseng admits that the ASM Lithography steppers have broken down or required service more often than the company's Nikon machines. He adds, however, that ASM Lithography's service staff has been vigilant and quick in performing repairs. Still, when asked about his criteria for selecting another 17 or 18 steppers for the next phase of the company's expansion in 1993, he says reliability will be a higher priority than price or performance.

"Sales, service, support, and reliability—those are often much more important factors than the technology," says VLSI analyst Hutcheson. He notes that Nikon, seldom known for being on the leading edge of new technologies such as i-line steppers, is nonetheless well-known for making machines that rarely break down. "They never introduce anything until it's bulletproof." Hutcheson says.

Hyundai's Ju says he thinks the performance and reliability of Canon and Nikon steppers are almost identical. He adds, though, that Canon's service is "excellent," and perhaps just a bit better than Nikon's.

Hiroshi Kato, Nikon's Asian sales and marketing manager, responds that his company is trying to recruit more people to strengthen the field service staff at its Korean office where it already employs about 30 people. Service is the key issue, he says, at least in terms of staying competitive with Canon.

UMC vice president Liu, on the other hand, isn't particularly interested in equipment suppliers' service capabilities. "If you have good reliability, you don't need service," he says, adding that reliability is his top criteria for selecting stepper equipment, followed by performance—better line resolution—and then price.

All other things being equal, Liu says, price can be an important deciding factor. In that particular category, he gives the best marks to Canon, adding that Nikon has been less willing to make concessions.

Goldstar Electron director Lee adds supplier longevity to the consideration list. The supplier should still be around in a few years offering support and spare parts, as well as new and improved equipment.

"Stability in the equipment manufacturer is perhaps the most important thing we like to see," Lee says, "and that is where the Japanese have an edge." He cites last year's sale of Perkin-Elmer Corp.'s lithography business as symptomatic of problems and uncertainty throughout the U.S. stepper industry.

U.S. makers come up short in the eyes of many Asian customers when all aspects of business stability, performance, reliability, and service are considered. "There simply isn't, as far as I know, a very attractive U.S. stepper company today," Lee says.

To be really successful, today's chip manufacturers "need to have it all," says Chang-Ho Kim, director of Korean operations for the trade association Semiconductor Equipment and Materials International, or SEMI. "In order to sell systems in Korea," he says, "you need to have the right price structure, service capability, and technology." Inevitably, he says, the vendor that offers the best combination of all those things will win the most orders.

Russ Arensman is a senior editor at Electronic Business Asia

Prices plummet in low-end laser printers

Bargains abound as vendors nibble away at Hewlett-Packard's lead by targeting market niches and offering enhanced functions

BY BARBARA JORGENSEN

With competition at the low end of the market putting an inexorable squeeze on prices, 1991 may be the year the laser printer replaces the dot-matrix on the desktops of the masses.

Lasers broke through the all-important $1,000 price point in 1990. During the past five months, Apple Computer Inc.—the number-two player in the market—and other vendors have been scrambling to meet an aggressive price challenge by Palo Alto-based market leader Hewlett-Packard Co., cutting prices in the hope of pushing boxes through reseller channels just to maintain market share.

"Competitors are trying to divide and conquer," observes Thad Webster, midrange product-line manager in HP's Boise, Id., printer division. "Customers are getting a great value out there." Activity is especially intense at the low end of the market, which most observers define as seven pages per minute (ppm) or less. Prices in that segment now range from $880 to $2,500.

One result of the competition is that the laser has begun to supplant the dot-matrix as the desktop printer of choice. According to market researcher InfoCorp, U.S. shipments of dot-matrix printers will plateau at 5.9 million units in 1991—a one-year increase of only 0.6%. By contrast, sales of desktop laser printers are expected to grow by 33% this year.

There are several reasons for that growth. One, of course, is falling prices, which are largely due to inexpensive Japanese "engines" and lower-cost memory. Another is the acceptance of slower printer speeds. Still another is the growing recognition of the devices' commodity status, at least at the low end. That moves them from the shared-resource to the "personal" environment, where the ratio of PCs/workstations to printers is 1:1, according to market researcher BIS Strategic Decisions. "The potential exists for thousands of personal workstation locations within *Fortune* 1000 companies," says a BIS source.

Price wars

There's little doubt that the price war is being led by HP, which recently slashed its LaserJet IIP by 14%. "If you position yourself against HP, you have to do it on price," says analyst Dan Miller at Dataquest Inc. In the under-6-ppm desktop market, InfoCorp expects an overall 7% drop in prices this year. But even higher-end lasers are vulnerable: InfoCorp predicts a 7% drop in the 7-ppm to 14-ppm group and a whopping 14.3% drop in the up-to-24-ppm market.

Several developments during early 1991 tell the story. In January Mannesmann Tally Corp. cut its MT906 laser's price by $500, and Epson America Inc. announced the 6-ppm EPL-7000 for a suggested retail of $1,399. In February Texas Instruments Inc. cut the prices of its MicroLaser family by $350. And in March Apple introduced the $1,299 Personal LaserWriter LS and cut prices on its three higher-performance LaserWriters by up to 21%, while Packard Bell's $1,995 8-ppm PB9815 fell to below $900.

The battle of the pricetags has led to fundamental changes in marketing and sales strategies. Toshiba America, for example, has dropped its high-end PageLaser 12 in favor of the PageLaser 6, to compete on the low end with other 4-ppm to 8-ppm vendors. And Apple recently broke the $2,000 barrier for the first time with its Personal LaserWriter LS—a move some analysts see as an attempt to stem the flow of other vendors niching into the Macintosh environment.

Sales channels are expected to change along with prices. The shift from traditional computer resellers to superstores and consumer electronics stores should accelerate this year, driving prices even lower. The street price of a 4-ppm laser could break $700, say analysts.

"My suspicion is the reseller isn't making any money," says Angele Boyd, analyst for International Data Corp., "but with prices dropping,

Printer price trends in 1991

(unit cost)

Make/Model	1990	1991	% Change
9-pin serial dot matrix	$ 398	$ 386	-3.0%
24-pin serial dot matrix	664	605	-8.9%
Under 6-ppm* desktop laser	945	879	-7.0%
7- to 14-ppm desktop laser	2,087	1,941	-7.0%
15- to 24-ppm workgroup laser	7,394	6,338	-14.3%
Desktop thermal transfer	5,906	5,292	-10.2%
Serial ink jet	681	643	-5.6%

*page per minute

Source: InfoCorp

there are new reseller channels popping up—superstores and mail order, for example. Those stores aren't working on margins, they're just moving boxes." In today's environment, she adds, computer resellers who have charged for value-added services simply can no longer justify their traditional margins.

Taking on the kingpin

The top two players in the low-end have been pretty consistent since Apple first gave kingpin HP a run for its money in 1985. The reason, say analysts, is that the companies have been able to offer upgraded products with enhanced features and gradually decreasing prices. Both Dataquest and BIS list the companies as market-share leaders but decline to release specific share numbers. InfoCorp, however, which *does* release market share figures, lists IBM (through its Lexmark operation) as the number-two player. Differences in gathering data account for the disparities.

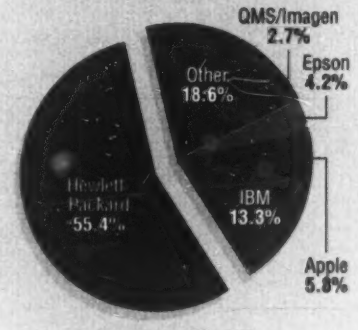
Either way, analysts and vendors agree that HP still rules the low end, largely by spanning the market with its LaserJet family. As it dominates that segment, other vendors have tried to compete wherever HP isn't. While HP generally sells through the national reseller chains, for example, others (including Toshiba) are geared toward mass merchants, notes Ron Matheson, Toshiba's director of marketing for printer products.

To compete with HP, major vendors have all tried to carve out a market share on the basis of price, niche, added value, and ease of use. Panasonic resellers, for example, are going after bar code applications in the consumer hard goods distribution market. Mannesmann Tally has tried to out-niche HP by introducing a fast-processing laser, priced at $2,195, for publishing and other tasks, says spokesperson R. Bruce Ridley. "We were able to process jobs faster than the 8-ppm to 10-ppm printer," he adds, "but all [the resellers]wanted to talk about was price." But QMS Inc. has stuck to its price guns—the 4-ppm PS410, $2,795, is selling "extremely well," a spokesperson says.

TI is taking on HP's LaserJet Series III with its MicroLaser. The key is to differentiate the company and the product, says Aubrey Brickhouse, TI's marketing manager for printer products. In this case, the difference is a smaller and lighter machine; as a result, Brickhouse claims, the company is becoming a larger factor in the low end. "We have gained some market share and are doing well," he reports. And while HP's channels are dealer-direct, TI gets to dealers through wholesalers. "In general, people that sell TI products are happy with their margins," says Brickhouse. In fact, say InfoCorp sources, TI and IBM have grown into significant factors in low-end lasers during the past few years. Together, the two companies now hold about 15% of the market.

HP leads the pack

U.S. unit market share of 4- to 6-ppm laser printers in 1990



Total units: 591,800

"Other" includes Okidata, Texas Instruments, NEC, Panasonic, among others.

Source: InfoCorp

In fact, the division that won IBM its market share will now be giving competitors a run for their money under its own logo—Lexmark. At the end of March, Lexmark International Inc. was formed through the sale of IBM's information products business for organization by Clayton and Dubliler Inc. An IBM alliance company (IBM still has 10% equity interest), Lexmark now has a sales force dedicated solely to Lexmark products. "We're gaining share slowly but steadily," says spokesperson Jim Gleason. "We intend to focus on service, our users, and our dealers."

Printers are inextricably linked to PCs, and HP and Apple have decided to sell through their PC channels. Apple has tightened the printer-PC bond, in fact, since the Personal LaserWriter LS is very limited unless linked to a Macintosh.

In the case of the LS, the company was told by focus groups that laser printers were too complex and had too many controls and add-ons. As a result, unlike its "smart" competitors in the low end, the LS doesn't have a microprocessor. "It has a power switch," says Duane Schulz, Apple's printer product-line manager. "You turn it on, paper comes out, and you turn it off." The smarts for the printer are all in the Mac. The QuickDraw program allows font types and sizing comparable to the more expensive Adobe PostScript page description language or Hewlett-Packard's PCL.

"We're not in the printer business for the sake of being in the printer business," says Schulz. "We want to deliver complete systems."

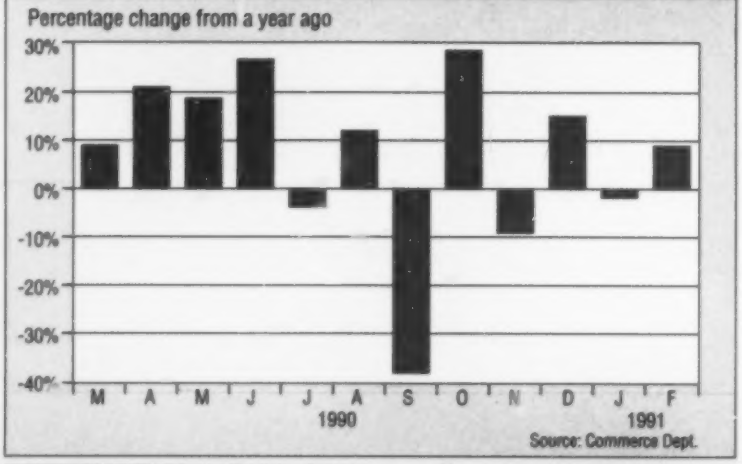
But, InfoCorp notes, nothing lasts forever. IBM, through Lexmark, and Panasonic have been making inroads. "Few resellers feel they're making money on the HP LaserJet," says Ed Pullen, analyst with InfoCorp. "The strategy to gain dealer attention is to add value, not cut price. One example is Star Micronics's promotion of offering 151 fonts free with its Star LaserPrinter4."

IDC analyst Boyd notes, though, that HP has long been responding to the dynamics of the market (witness the entrance of HP's IIIP). "HP is not an arrogant vendor," Boyd says. "Apple and IBM priced their products higher than other parties but felt it was justified. They were slow to respond to market pressure."

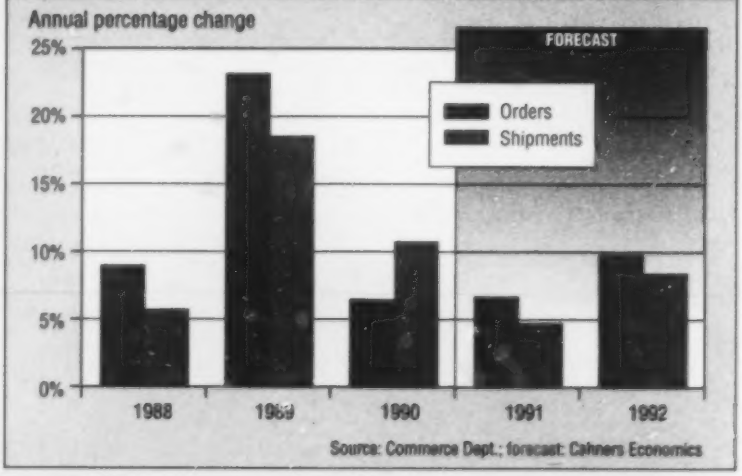
Boyd points out that most vendors offering low-end entries also have machines at the high end, offsetting the low end's extreme pressure. "The margin pressure," she says, "is a dynamic evidenced over the past few years, forcing vendors to move more carefully—and push many boxes." HP, for example, has kicked off the $5,495 LaserJet IIISi, the company's first RISC-based offering, while the $1,595 IIIP addresses some resolution and power issues in a smaller package.

As for an expected low-end shakeout, HP's Webster isn't chortling yet. "I guess it's too early to call it a victory," he says, "but our business continues to be good. In the low end, we think we're going to survive because we're bringing success to the other areas. Survival is not a matter of price. There's a finite level and a number you can operate with. It's a marathon, not a sprint." □

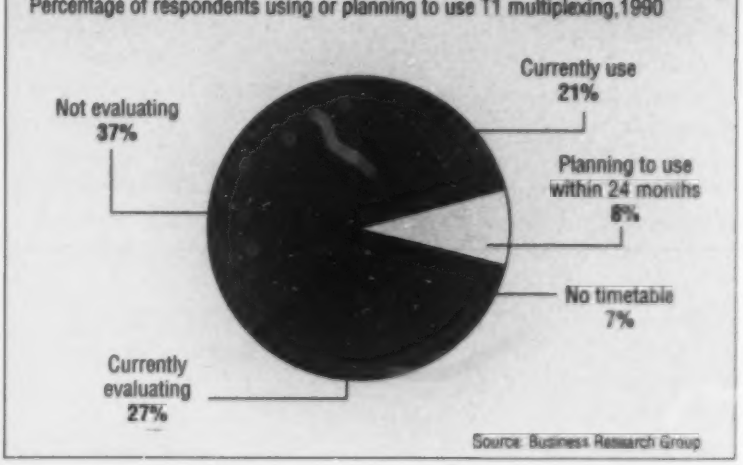
Rough ride for communication equipment orders...



...but healthy growth is forecast for future...



...as users switch to new technology



Communication equipment sees rekindling

As the Persian Gulf War escalated, the communications equipment industry suffered quite a beating. However, with business confidence again on a more even keel, the information explosion is rekindling demand for equipment such as local area networks, voice messaging systems, and digital switches. So telephone and data communications orders and shipments will enjoy relatively healthy growth despite the recession.

During the first half of last year, billings for telephone gear, facsimile machines, multiplexers, and other communications equipment swelled 17.9% from the year-ago period. By contrast, in the final six months of 1990, orders dropped 2.8% from the second half of 1989. Clearly, fears of a prolonged Middle East conflict and deepening economic woes at home squelched capital spending plans, even for high-tech gadgetry.

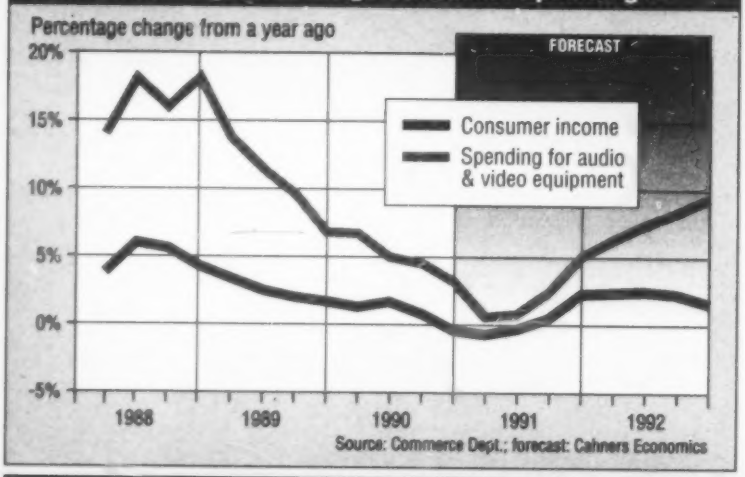
The communications equipment industry is showing initial signs of breaking away from the recession. In February, orders grew 21.5% from January and 9% from the strong showing of February 1990. The industry should anticipate some setbacks; full-fledged resumption of stronger growth is not expected until a little later this year. New orders are forecast to grow 6.7% this year and 9.8% in 1992.

Since they encourage productivity, many communications equipment markets will enjoy above-average growth. Businesses will invest in enabling technology as part of their competitive strategy. For example, in a recent survey of information systems managers, Business Research Group, a Newton, Mass., consulting firm, found that 21% of respondents currently used fractional T1 multiplexing, another 15% plan to use this technology within the next 12 months to 24 months, and 27% are currently evaluating the technology. The growth in T1 fractional lines translates into the need for equipment with fractional capability. BRG predicts that sales of multiplexers equipped for fractional T1 will more than double from $32 million in 1990 to $77 million in 1993.

MADELINE FRANCHI

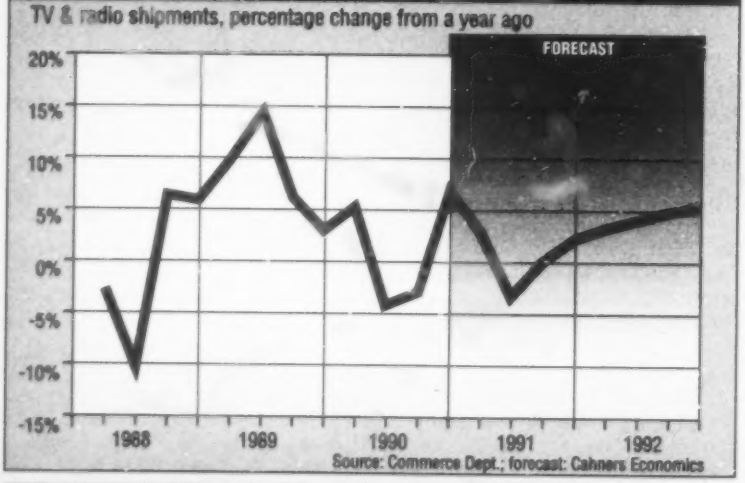
Note: With the release of February data, the U.S. Department of Commerce revised all shipments and orders data consistent with the 1987 Standard Industrial Classification codes. Search, detection, and navigation equipment formerly classified as communication equipment has been shifted to instruments and related products. All historical data and forecasts have been revised accordingly.

Slow income growth drags consumer spending...



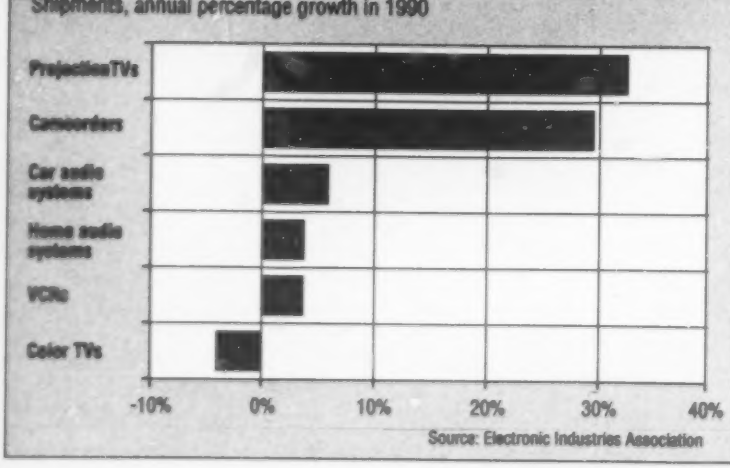
Source: Commerce Dept.; forecast: Cahners Economics

...and dampens consumer electronics shipments...



Source: Commerce Dept.; forecast: Cahners Economics

...but new products will keep going strong



Source: Electronic Industries Association

Consumer electronics defies recession woes

The consumer market has taken a number of hard hits lately. Consumer confidence fell in January to its lowest level since 1982. Disposable personal income increased just 0.9% last year, after adjustment for inflation. Unemployment rose to 6.8% in March. All of this suggests that the consumer electronics market should be suffering a period of despair. In fact, sales have remained relatively strong.

Spending for consumer audio and video equipment jumped 4.8% in 1990. Although historically slow for the industry, that growth rate outstripped the 0.9% gain seen for all consumer purchases. Shipments of television and radio equipment fell 4.2% in the second quarter and 2.9% in the third quarter of 1990 compared with a year earlier; but as the rest of the economy entered a recession, sales climbed 6.9% in the fourth quarter. This trend continued into 1991, with January sales soaring 25.2% above January 1990.

Sales data from the Electronic Industries Association reveals the biggest product gainers were projection TVs—which climbed 32.5% in 1990—and camcorders, which rose 29.5%. In addition, audio components and systems grew at a moderate 3.8% rate, and automobile audio equipment rose 5.9%. The color TV market also revealed better conditions than expected by falling only 4.1%, after a record-high sales figure in 1989.

Because of the recession, consumers have deferred spending for big-ticket items such as cars and vacations in favor of less expensive purchases such as home entertainment systems. Retailers are eagerly awaiting a return to double-digit sales growth like that of the late 1980s.

However, mounting consumer debt, which totaled $740 billion at the end of 1990, will impede higher spending in the near future. Disposable income is also expected to inch up only 0.5% in 1991. As a result, our forecast calls for a mild 2.2% rise in consumer spending on TV and radio equipment in 1991.

JOHN FARRELL

For more information on Cahners Economics' forecasting services, including seminars, newsletters, and database diskettes, contact Dan Buchan at (617) 630-2105 or by fax at (617) 630-2100; or write Cahners Economics, 275 Washington St., Newton, MA 02158